

The Strata-1 Regolith Dynamics Experiment: Class 1E Science on ISS

PROJECT MANAGEMENT: PI: Marc Fries, XI; PM: Lee Graham, XI; Deputy PM: Kristen John, XI

OVERVIEW

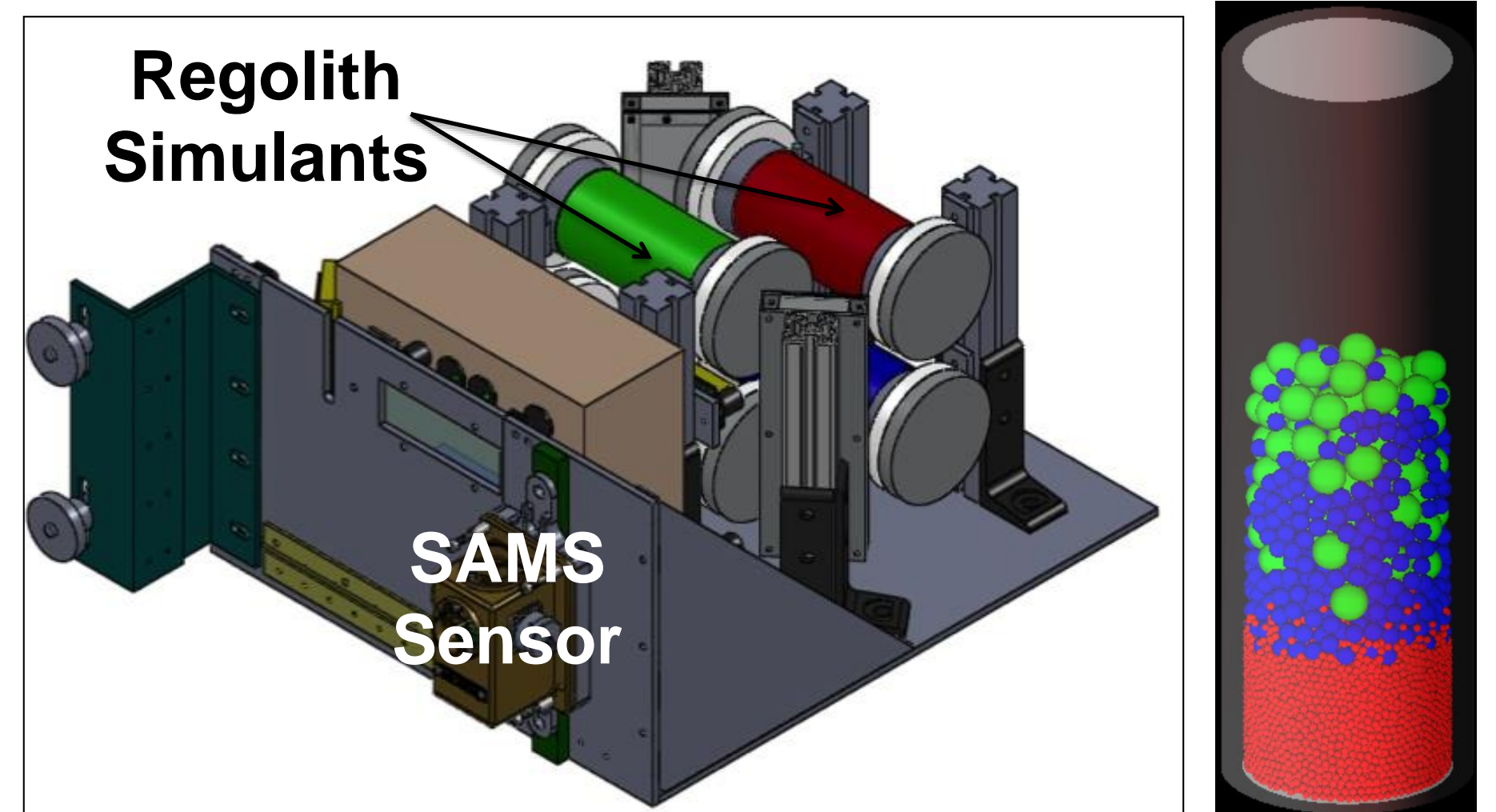
The Strata-1 experiment studies the evolution of small body regolith through long-duration exposure of simulant materials to the microgravity environment on the International Space Station (ISS). This study will record segregation and mechanical dynamics of regolith simulants in a microgravity and vibration environment similar to that experienced by regolith on small Solar System bodies. Strata-1 will help us understand regolith dynamics and will inform design and procedures for landing and setting anchors, safely sampling and moving material on asteroidal surfaces, processing large volumes of material for in situ resource utilization (ISRU) purposes, and, in general, predicting the behavior of large and small particles on disturbed asteroid surfaces. This experiment is providing new insights into small body surface evolution.

INNOVATION

Strata-1 is the first long-term investigation into the dynamics of small body regolith in microgravity. Results will inform current and future models of asteroid formation and dynamics. Strata-1 allows fundamental investigation of small body regolith ahead of manned interaction with asteroids and comets, and informs science results of sample return missions, e.g. OSIRIS-REx and Hayabusa-1 and -2.

OUTCOME

- Strata-1 is currently operating on ISS and is six months into its one-year mission
- Preliminary results indicate a combination of anticipated materials behaviors and “interesting” behavior. Study is underway.



Left: The Strata-1 instrument showing four tubes of regolith simulants, each observed with a camera. Materials are trapped in place for launch and landing. Right: A modeled expected result for one of the simulants; compare this with the images at the bottom.

PARTNERSHIPS / COLLABORATIONS

Strata-1 features design and engineering collaborations with Texas A&M and T-STAR. Science partnerships include U. of Central Florida, U. of Colorado, Southwest Research Institute, and U. of Maryland. Strata-1 also serves as a pathfinder mission for future Class 1E missions which will interact with the science community.

PAPERS / PRESENTATIONS

Four meeting abstracts have been produced to date, and a peer-reviewed paper is in production.

Images Below: Two of the four regolith simulants on Strata-1, as imaged in microgravity. Left: Glass fragments showing “Brazil nut effect” sorting. Right: Pulverized meteorite showing separation into densely-packed and loosely-packed strata. Overall, Strata-1 has revealed a combination of expected and unexpected behaviors.

